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Controlled Assembly of Viral Nanoparticles for Biomaterials Development

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Alignment of nanoparticle building blocks into ordered hierarchical structures is currently of key importance in colloidal and materials chemistry. Self assembly is the most effective way to build up sophisticated structures at the nano- and micrometer scale. In our study, we chose viruses and other biological particles as natural building blocks that can be tailored chemically and genetically. Compared with synthetic nanoparticles, the uniform shape and size of viruses provide highly promising possibilities for the self-assembly of nanoscale materials with hierarchical ordering. In particular, three different assembly methods have been developed and utilized in our research: interfacial assembly, convective assembly, and controlled assembly at the three-phase contact line. By using these methods, spherical and rod-like viruses can be assembled into hierarchically organized structures, which offer unique scaffolds for applications in drug delivery and tissue engineering.